

portion of the nose-leaf, and having also the last caudal vertebra free.

Ph. coronata, Peters, from the Philippine Islands, approaches this species in size and in the remarkable length of the calcaneum; but the very different form of the nose-leaf and ears at once distinguishes it.

7. On *Latrunculus* and *Crystallogobius*, two remarkable Forms of Gobioid Fishes. By ROBERT COLLETT, of Christiania, C.M.Z.S.

[Received February 18, 1878.]

Upon different occasions, at meetings of the Scientific Society of Christiania, I have communicated my observations on a singular group of our Gobioid fishes, which differ from the typical genus *Gobius* not only in the almost perfect transparent body, but also in differences in the structure of the scales, fins, and the form of the body¹.

As the said group in several points offers much of interest, I will endeavour to relate the general results of these researches, all of which have been made in the Christiania fjord, a most favourable locality for marine fishes and invertebrates. From these researches I find :—

1. Each of the genera, *Latrunculus*, Günth., 1861, and *Crystallogobius*, Gill, 1863, include one single species, *L. pellucidus* (Nardo) 1824, and *C. nilssonii* (Düb. & Kor.) 1844.

2. *Latrunculus pellucidus* (Nardo) from the Mediterranean, *L. pellucidus* (Kessler) from the Black Sea, *L. albus* (Parn.) from Scotland, and *L. stuwitzii* (Düb. & Koren) from Norway are all one and the same species.

3. The males of both species have a dentition totally different from that of the females; in *L. pellucidus* these teeth are only developed during the spawning-season.

4. The female of *C. nilssonii* has the first dorsal and the ventral fins rudimentary; and the ovaries of this species reach back far behind the vent.

5. Both species are *annual* vertebrates, and accomplish their life in the course of one year.

Genus LATRUNCULUS, Günth.

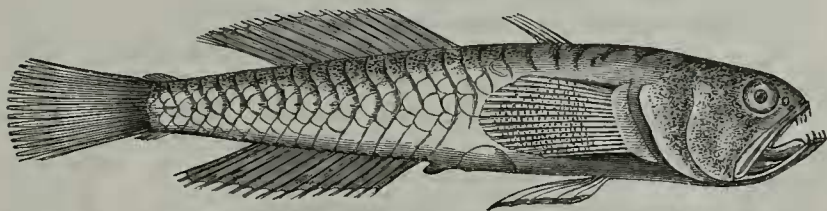
Genus *Latrunculus*, Günth. Cat. Acanth. Fishes, Brit. Mus. vol. iii. p. 80 (1861).

Body transparent, elongate, rather compressed, covered with large, deciduous, rounded scales attached to parallel muscular impressions. Both sexes dentiferous, the mature male with a series of long teeth,

¹ Slægten *Latrunculus* og dens nordiske Arter (Forh. Vid. Selsk. Christ. 1872). Norges Fiske, med Bemærkninger om deres Udbredelse (Tillægsh. til Forh. Vid. Selsk. Christ. 1874). Om Slægterne *Latrunculus* og *Crystallogobius* (Forh. Vid. Selsk. Christ. 1876).

and with strong canine teeth, which form the hinder series in the upper jaw. Two separated dorsal fins, the first composed of 5 spines. Ventral fins united, gill-openings rather wide. Pseudo-branchiæ present.

Fig. 1.



Latrunculus pellucidus ♂ ad., in the breeding-season, ♀.

L. PELLUCIDUS (Nardo).

1824. *Gobius pellucidus*, Nardo, Giorn. Fis. Chim. Stor. Nat. Pavia, tom. iii. Osserv. p. 7 (*teste* Günther).

1826. ? *Aphia meridionalis*, Risso, Hist. Nat. Eur. MÉR. tom. iii. p. 287 (Paris, 1826).

1837. *Gobius albus*, Parn. Trans. Roy. Soc. Edinb. vol. xiv. p. 137, Feb. 1837 (Edinb. 1840).

1844. *Gobius stuwitzii*, v. Düb. & Kor. Kgl. Vet. Akad. Förhandl. 1844, p. 51, tab. ii. fig. 4 (Stockh. 1846).

1859. *Gobius pellucidus*, n. sp., Kessl. Bull. Soc. Nat. Mosc. 1859, tom. xxxii. No. 2, p. 260 (Mosc. 1859).

1861. *Latrunculus albus*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 80, and p. 556 (Lond. 1861).

1861. *Latrunculus pellucidus*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 556 (Lond. 1861).

1861. *Gobiosoma stuwitzii*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 86 (Lond. 1861).

1863. *Boreogobius stuwitzii*, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (Philad. 1864).

1872. *Latrunculus stuwitzii*, Coll. Forh. Vid. Selsk. Christ. 1872, p. 9 (Christiania, 1873).

Teeth in the mature male long and cylindrical, and with strong curved canine teeth in both jaws; teeth in the female and the immature male minute. The ventral fins united to a funnel, with the longer rays towards the body. The ovaries do not project behind the vent.

D¹ 5, D² 13 (12); C. 10+17+10; A. 14; V. 6; P. 16;
Lin. lat. 25; Vertebr. 27; M. Br. 5.

A. Remarks on the Synonymy.

The first northern form of the transparent Gobioids was discovered by Parnell in the Scottish friths, and shortly described in Feb. 1837, in the 14th volume of the Trans. of the Royal Society of Edinburgh, under the name of *Gobius albus*. His description (which, by the way,

is rather incomplete) has afterwards, without any further addition, been repeated in the various editions of Yarrell's History of Brit. Fishes. In May, 1844, Von Düben and Koren in Öfv. Kgl. Vet. Akad. Förh. for the same year introduced two other species of the same group, both of which had been previously found, in Dec. 1834, in the district of Bergen, Norway, by the late naturalist, Mr. P. Stuwitz, after whom one of them was named *Gobius stuwitzii*. The last-named species had certainly, as pointed out by the authors, a decided similarity to the Scottish *G. albus*. Still the difference in the construction of the body, as well as of the teeth, was so obvious that they could not easily be mistaken. Instead of being plump, like *L. albus*, with the head thick, the cleft of the mouth wide, the teeth long, the interorbital space wide, the second dorsal and the anal fins even, *G. stuwitzii* was slender, with the head thin, and the cleft of the mouth short, the teeth extremely feeble, the interorbital space narrow, and the second dorsal and the anal fins diminishing behind. In 1861, Dr. Malm, in Bohuslän, Sweden, found both the named species in fully developed state, one of them (*G. stuwitzii*) with ripe spawn; and he therefore gave, in July 1863, in the Förh. Skand. Naturf. 9. Môte, comparative diagnoses of them, chiefly based upon the structure of the teeth and the vertical fins.

When Dr. Günther, in 1861, issued the volume of his Catalogue of the Fishes of Brit. Museum, in which he treats of the Gobioids, *G. albus* was made the type of the new genus *Latrunculus*¹; but, from the description of *G. stuwitzii*, he did not venture to include this under the same genus; for want of a better place he inserted it under the genus *Gobiosoma*, Gir., as it was still undecided that it possessed scales, which, for the first time, was proved by Dr. Malm in 1863. Prof. Gill, in the Proc. Acad. Nat. Sci. of Philadelphia for 1863, even made it a type for a new genus *Boreogobius*, without giving even a single word of reason for this alteration; and Dr. Bleeker, in 1874, followed in his steps in the Synopsis of the Gobiidæ, which he communicated in the 9th volume of Arch. Néerl. Sci. Exact. et Nat.

Since the autumn of 1871, I have found the form *L. stuwitzii* in the Christiania fjord in great numbers, and have collected innumerable specimens during the autumn months. All these specimens have fully agreed with the original description given by Düben and Koren, and consequently are constantly different from that of Parnell's *L. albus*. Having provided myself during the first autumn with what I thought sufficient materials, consisting of several thousand specimens, I gave, in the Forh. Vid. Selsk. Christiania, 1872, a short description of the species, comparing it with the descriptions at hand of *L. albus*, in which I endeavoured as much as possible to keep the two species separate. During the succeeding years I tried amongst the great quantities of *L. stuwitzii* to find *L. albus*, but without

¹ The name *Latrunculus* was employed by Dr. Gray as early as in 1847, for a Gasteropod (Proc. Zool. Soc. Lond. 1847, p. 139). But, as I was informed by my friend the late Dr. Mörch, of Copenhagen, this name is quite superfluous, and will hardly ever be reemployed for that mollusk.

success. In the winter months the fjord is covered with ice; and in the spring and summer I had no opportunity of tracing them. In August 1874 I certainly found a couple of breeding females, together with some others which had already spawned; but none of these differed in any point from the typical *L. stuwitzii*; and in September again the young of the year solely were seen. Therefore I could add nothing of importance to my previous researches published in the 'Norges Fiske' in 1874.

It was almost accidentally that, in June 1875, I found one of the spawning-places; and during a couple of excursions I succeeded in collecting a considerable number of fully developed specimens of both sexes. It then became quite evident that *L. stuwitzii* was based on the female and the immature males of the same species, the mature males of which were *L. albus*. On several occasions examples of typical *L. albus*, which all, without exception, proved to be old males, were taken from the same shoal as *L. stuwitzii*, all of which were females ready for spawning. Another lot consisted of somewhat younger specimens in various stages of transformation between both forms, all full-grown, but with the eggs and milt not yet perfectly ripe.

Von Düben and Koren described their species from four specimens taken in winter (in the month of December), and consequently out of their spawning-season; but Parnell, on the contrary, had for the description of his *Gobius albus* 50 specimens caught in June in Solway Frith, thus just during their breeding-time. From Parnell's description we may conclude that he had only mature males at his disposal; nor does Dr. Günther, in compiling his catalogue (1861), seem to have had at his disposal any females,—as may be seen from the fact that both these authors speak only of individuals with long teeth. By the kindness of Dr. Günther I have received three specimens of the Scottish form, collected by Parnell himself; and one of these, curiously enough, proves to be a female with the minute teeth and the sloping fins, in other words, a typical *L. stuwitzii*. Thus Parnell had overlooked female individuals, perhaps few in number, and had drawn his description solely from the males.

Having endeavoured to identify the two species of Western Europe, it remains to discuss the third and fourth species of this genus, the *L. pellucidus* of Southern Europe.

In 1824, according to Dr. Günther, a description was given by Nardo of a Mediterranean form under the name of *Gobius pellucidus*. I have not had an opportunity of seeing the periodical in which Nardo gave his original description (Giorn. Fis. Chim. di Stor. Nat. d. Pavia); but from the title of the paper ("Osservazioni ed aggiunte all' Adriatica Ittiologia") it seems that his specimens were taken in the Adriatic. The species since Nardo's time has often been mentioned by those naturalists who have treated upon the fauna of the Mediterranean, and, as it appears, under somewhat different names. In Hist. Nat. Eur. Mérid. tom. iii. p. 287 (1826), Risso mentions a species under the name *Aphia meridionalis*, n. gen. et sp.,

which perhaps may be the same as Risso's, although it can hardly be proved with any certainty, as the description is, in the first place, too incomplete, and, secondly, disagrees in several respects with our species. It is therefore scarcely advisable to adopt the generic name given by Risso; but if this naturalist really had in view *L. pellucidus* (which is very probable), his description, besides being incorrect¹, is also incomplete, from no notice having been taken of the mature male. Another generic name, which is ascribed to Nardo, is *Brachiochirus* (cf. Bonap. Cat. Method. Pesci Europ. p. 64, Napoli, 1846, and Atti Ist. Veneto, tom. v. ser. 3, p. 796, Venezia, 1859-60); but I have had no opportunity of examining the work wherein that genus is established². Canestrini mentions the species, in his memoirs on the Gobioid Fishes found in the Gulf of Genoa (Arch. Zool. Anat. Fisiol. fasc. ii. vol. i. p. 152), under the name of *Gobius albus*, Parn. This author shows the difference in the structure of the teeth between the sexes in the Mediterranean form, without, however, bringing his description to bear upon the young male.

Last year I received from Prof. G. O. Sars a couple of specimens of the Adriatic form, collected by him during a stay in Trieste in the spring of 1876. As it seems to abound there, and is well known to all fishermen, it is very possible that it is Nardo's *G. pellucidus*; and it has therefore been of much interest to me to be able to make a comparison between this and the northern form, with which it agrees in development (*L. stuwitzii*). This comparison has been thoroughly conclusive of the fact that they are identical. The specimens from Trieste were collected in the month of March, and had then not yet reached their fully mature state. Their total length varies between 42 and 44 millims.; otherwise the length of the head, the size of the eyes, the general structure of the body, the number of rays and of the transverse muscular striæ—further, the teeth—in short, every thing, down to the most minute spots of the coloration, completely agrees with specimens of the same size and state of development from Christiania.

Finally, Kessler, in Bull. Soc. Imp. Nat. Mosc. tom. xxxii. (1859), gives a tolerably detailed description of a form from the Black Sea (Odessa), which he calls *Gobius pellucidus*, n. sp., being apparently ignorant of Nardo's previous description of a species of the same name.

With regard to this form, it does not seem to differ at all from *L. albus* (or the male in spawning-season). The distinction between them, which Dr. Günther thinks may be made, that Kessler's species has a larger diameter of the eye, namely $\frac{1}{4}$ of the length of

¹ This is especially the case with regard to the description of the fins and their rays; the number of the rays in the first dorsal is also omitted, which is a point of great importance.

² If in Risso's *Aphyia* and Nardo's *Brachiochirus* we can recognize *Latrunculus pellucidus*, both these names will have priority over *Latrunculus*, Günther. The decision of this, as well as other similar questions of priority, I leave to those who have greater opportunities of examining the literature of Southern Europe than can be obtained here in the library of the University of Christiania.

the head, and equal to the snout, whilst, on the contrary, the eye of *L. albus* is contained 5 times in the length of the head, and is shorter than the length of the snout, is of little consequence, as in fact both the original specimens of Parnell and those from the Christiania Fjord have rather the proportions of length given by Kessler. Although this author expressly remarks that he knows the mature females, he must have overlooked (as well as Parnell) the differences between these and the males, and in his description (for instance, of the structure of the teeth) only have taken notice of the latter.

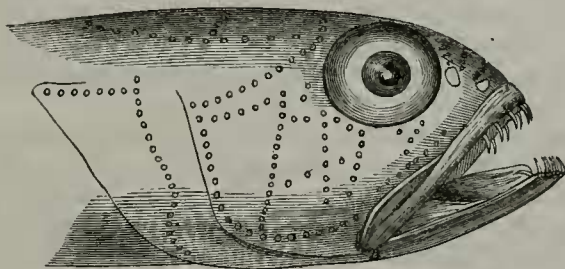
B. General Description.

Before entering into a more detailed description of the species in general, I will briefly point out some of the principal peculiarities which separate the individuals in the different periods of life. From this it will be seen that the difference in the sexes of the species in the fully developed state is considerably greater than with any of our northern species of the typical genus *Gobius*.

Out of the spawning-season the males and the females (which at this time only exist in the shape of young specimens) are exactly alike in appearance, although they soon reach the size of the old ones. The body is slender, the head pointed; the jaws, in consequence, are less oblique, and seem, therefore, to be shorter. The teeth are all uniform, minute, and form a close single row. The caudal fin is slightly emarginated, the second dorsal and the anal diminishing behind. In this stage they are all typical *L. stuwitzii*.

The nearly mature males, the milt of which is not yet quite ripe, have the head considerably more thickened, and longer jaws; besides the minute teeth, there is become visible an outer row of cylindrical teeth, yet not full-grown, but having reached a greater length than the others. The posterior rays of the second dorsal and the anal fins are still lower than the anterior; the caudal is slightly emarginated, or square.

Fig. 2.



Head of *Latrunculus pellucidus*, mature male, magnified.

The mature males have an average total length (the caudal included) of 42–43 millims. (a few have the milt ripe, with a total length of 40 millims.), but reach a size of 50–51 millims. The body is plump; the head thick and tumid; the interorbital space broad; the cleft of the mouth wide, with fully developed teeth of only one

kind, few in number, but long and cylindrical. The posterior rays of the anal and second dorsal fins are, as a rule, not shorter than the anterior, making the fins about even in their whole length. The caudal fin is slightly square, with rounded edges in the young individuals, but truncated in the elder ones.

The nearly mature females, not yet quite ready for spawning, agree in general with the individuals in the immature state, from which they differ in the somewhat swollen belly.

The females ready for spawning have an average length of about 42 millims.; many having the spawn ripe are of a length of 38 millims.; none reach a length of more than 46 millims. (the caudal included). The head is not visibly thickened, but is about the same as during the whole young period; it is rather more pointed than in the male; the cleft of the mouth is considerably smaller, although the jaws may possibly have become a trifle longer than before. The teeth, however, have not undergone any change, but are uniform, exceedingly fine, and placed in the same row as in the young individuals. The caudal fin is emarginated, and the anal and the second dorsal are tapering behind, as is the case in their younger state.

The construction of the body is slender and elongated, laterally compressed; and it is only during the spawning-season that the body of the male becomes thicker and more plump.

A specimen of medium size out of the spawning-season has a total length of 40 millims., of which the head is 9 millims.; and this is contained about 4·4 in the total length (the caudal fin included). The greatest height is 5·5 millims., or contained 7·2 in the total. The vent is situated about 2 orbital diameters nearer the snout than the root of the caudal.

In the spawning-season the body becomes fully developed, although the total length does not increase. In a male with a total length of 40 millims. the length of the head is 9·5 millims. (4·2 in the total); in the female about the same as before.

The eyes have a diameter of 2 millims., and occupy $\frac{2}{9}$ of the length of the head. The orbital space, which, as a rule, is narrow, and does not reach the breadth of an orbital diameter, has in the mature male fully the last-named breadth.

The number of the gill-rays is 5; the gill-openings are wide, and stretch forwards to about the middle of the orbit.

The mouth is oblique, and the lower jaw longer than the upper, the maxillary extending to below the middle of the orbit. During the spawning-season the jaws of the male become considerably larger and more oblique; at the same time, the head and all parts of the body become swollen, the jaws extending much deeper under the eye.

The number of the vertebræ is 27; the processus spinosi are very long, and reach almost to the dorsal and ventral line. The medulla spinalis extends as far back as to the middle of the 22nd vertebra.

The teeth.—Before the spawning-season the structure of the teeth is exactly alike in both sexes. In each of the jaws is found on both sides a single series of 20–25 minute and very closely fitted

teeth, which project very little beyond the jaws. Only the innermost part of the lower jaw is entirely toothless. These teeth make their appearance very early in the young. In a young specimen of scarcely 14 millims. length, some very minute (microscopical) teeth are already visible in the front part of the lower jaw, although they cannot with certainty be seen in the upper. In specimens of the total length of 23 millims. there are some small teeth visible in both jaws; and on being dried, one may see that some of them are already developed; still they continue to be minute until the specimens have reached their full length.

The teeth of the female undergo no special alteration the whole of their life through, but continue during the spawning-season in the same state as before; but in the males, on the other hand, these minute teeth of young specimens begin to disappear towards the spawning-season, and are replaced by a set of long and cylindrical ones. These long teeth do not proceed from the minute teeth, but constitute an entirely new set, which shoot forth at the same time as the original set disappears. In the specimens wherein the organs of generation are still not fully mature, both sets of teeth are visible for a short period at the same time, the new set only half developed.

Finally, during the spawning-season all the minute teeth of the male have almost entirely disappeared, and are replaced by the new, long, and almost straight teeth, situated at a remarkable distance from each other, and chiefly to be found on the front part of the jaws. In the lower jaw their number is 4, or sometimes but 3, on each side; they are not particularly pointed, but almost cylindrical, only slightly curved, and placed almost vertically upon the outer edge of the jaw. At a little distance below and inside the last of these teeth, on each side, is found a sharp, curved tooth (canine) directed backwards and almost in the form of a claw. In the posterior half of the jaw the prolonged teeth are missing, a few of the minute teeth of the young period still remaining here.

In the upper jaw the number of the long teeth is 5 on each side, of which a few (1-2) are also to be found behind the middle of the jaw. In the upper jaw there is also found, inside the ordinary row on each side, the curved canine, which is directed backwards; this canine is placed further in front than the opposite one in the lower, or nearly at the point of the jaw. There may further be found in the posterior part more or less remaining of the original minute teeth, whilst these only exceptionally are found at the point of the jaw.

The fins.—The first dorsal fin has 5 rays, and is a little higher in the full-grown males than in the females, without, however, reaching the height of the body. All the rays are about evenly high, undivided, feeble, and rather closely set. This is one of those fins which appear latest, and is entirely wanting in specimens of a total length under 16 millims., wherein all the remaining fins have already got their rays. In individuals of the total length of about 22 millims. this fin is found with extremely feeble and short spines, which are often difficult to detect.

The distance between the two dorsals is at least so great that the rays of the first can never reach to the commencement of the second.

The second dorsal fin has 13, rarely only 12 rays, the last of which is a double one, although not divided in many young individuals. In the full-grown female, as well as in immature individuals of both sexes, it strongly decreases posteriorly: the first is only half as long as the second and third, which are the longest; after this the length diminishes successively, and the last (the double one) has scarcely the length of the first. The first ray is not articulated; the remaining are all articulated; the first and the second are single, the remaining divided at the point (the double ray only in its innermost branch). In the mature male the posterior rays are lengthened, the fin becoming almost even; the point of the posterior rays reaches a distance of the diameter of the eye from the root of the caudal fin, this distance being considerably larger in the females and young individuals. The caudal fin has 17 articulated rays, besides a row of 10 short, feeble, unarticulated, supplementary rays on each side. All the articulated rays (with the exception of the two outermost on each side) are twice divided in the outer two thirds of the fin. The length of the fin does not exceed considerably the height of the body. Its form in young specimens, as well as in the female is always slightly emarginated, which is also the case with a great number of the males during the spawning-season; other males have the caudal fin square, with rounded corners; and it is only in the case of the older that the middle rays are longer than the other ones, by which means the form of the fin becomes rounded.

The anal fin has 14 rays, the last of which is a double ray. In its construction and position it agrees in general with the second dorsal; and having a ray more, it stretches a little further back than this.

The pectoral fin has 16 articulated rays, all of which, with the exception of the outermost on each side, are divided in the outer third of the fin, and after the fourth ray doubly divided. The form is somewhat pointed; the point is scarcely the distance of one diameter of the eye from the vent. In accordance with the rule in the generality of fishes, this fin is one of the latest developed; in a specimen with a total length of 19 millims., it consists only of a rounded flap, in which there is a vestige of a few rays.

The ventral fins have their origin beneath the root of the pectorals, and consist each of 6 rays. These together form the more or less developed funnel, which is typical of the subfamily *Gobiinæ*. When expanded, the opening of the funnel forms an oblong ring, which runs parallel with the ventral line. All the rays are three times divided down to the root, and are very movable. In the full-grown male the extreme point reaches almost as far back as the pectorals. In the female and the immature males the ventrals are very much shorter, the funnels and the outer division of the rays indistinct; the extreme point is distant more than half the length of the head from the vent.

*The mucous glands*¹, the true nature of which has perhaps not yet positively been proved, are to be found on all parts of the head in longer or shorter rows, which vary comparatively little in the different specimens. To give a more detailed description of them would require too much space; but a drawing (see fig. 2, p. 323) has been taken from a comparison of several specimens. Two parallel series across the hinder part of the interorbital space are easy to be observed, as may also two others, running along the upper side of the snout, and sending forth some shorter series down to the nostrils. The rest of these glands reach as far back as to the first dorsal fin; and shorter rows are found immediately behind the ventrals.

The scales and the skin.—The whole body, with the exception of the head and fins, as well as the neck, throat, and belly, down to the vent, is covered with large and very easily deciduous scales. These are fastened to transverse muscular impressions, which bend together in the lateral line of the body, where the vertebræ are connected. The scales are arranged along the sides of the body thus:—First a series of 25 scales are fixed along the lateral line; above and below this row run two other rows; so that together there are 5 rows between the dorsal and ventral line. The scales are perfectly transparent, membranous and cycloid; in the lateral line they are a trifle smaller than in the other rows; they are comparatively large, having a diameter of nearly 1 millim., and are few in number. According to the above statement the total number of scales would be hardly more than 100 on each side of the body. The period in which the scales are developed I have not been able to observe to a certainty, as the scales in young specimens seem to be still more easily deciduous than in the older. In the smallest specimen I have found, with a total length of 13 millims., the transverse impressions, to which the scales are fastened, are already visible; but I have not detected the scales themselves before the specimens have attained about half their size.

The colour.—When alive the whole body is almost perfectly transparent, having only a few minute stellulate pricks in the skin. One may without difficulty count the vertebræ from the outside, and clearly distinguish the brain with its different parts, as well as the pulsation and the blood-corpuscles. The most coloured part of the body is the eye, and the innermost part of the black bladder. When preserved in spirits, or in a frozen state, they soon become white and opaque, whilst if preserved in glycerine they remain half transparent; then the minute pricks become fainter, whilst the iris always retains its silvery colour.

In the breeding-season the minute pricks become more numerous, especially in the males. A row of these pricks, yellowish red in colour, stretches along the sides, corresponding in number to the vertebræ. Along the dorsal line another row of brown pricks is found. Along the anal fin, on each side of the root of the rays, is a row of black pricks, which continues behind the end of the fin in

¹ "Stripes of minute warts," Günther, Catal. vol. iii. 1861; "External papillæ of taste," Winther, Naturh. Tidsskr. 3. R., 9. B., p. 181, Kbhvn. 1874.

the shape of a short black stripe; this is the most conspicuous and durable of all the rows, and is never wanting. The caudal fin has a brownish shade; sometimes this is also the case with the anal fin, whilst all the other fins are hyaline. The iris is silver-coloured, with black pupil; the upper margin of the eye is golden, which, after death, changes to a black. The younger individuals are more sparingly pricked; the row along the anal fin is the first which shows itself, and is already visible in the young ones, with a total length of 13 millims., where all the other pricks are wanting.

In the males in full breeding almost every part of the body has a faint brownish light, although this is nowhere collected into larger dots, but is most distinct along the transverse impressions of the muscles.

C. *Habits and Distribution.*

Generation.—It is probable that no specimen lives more than one year, and after the close of the breeding-time dies without living through another spawning; consequently these fishes are really *annual vertebrates*.

The spawning-season occurs in the Christiaua Fjord in the summer months. The latest date at which I have found females with ripe spawn was on August 2, 1872, although the greater number of them had then already spawned. The normal period of spawning is the end of June or the beginning of July. On the 10th and 14th of August, 1875, I found them in the middle of their breeding, although several were still not quite mature. When the spawning is finished all the specimens disappear entirely, and become apparently extinct.

The first young ones I took on August 28, 1875, when their average size was 22 millims.; a few specimens were rather larger (attaining about 30 millims.), or less (down to 13 millims.). At the same time there is not a single specimen of a greater size to be found at those places where they, in the middle of June, were found in numbers and only in a full-grown state.

A month later the median length may be estimated at 34 millims., in the end of October at 38 millims. The development proceeds tolerably even with them all; and specimens are very rarely to be found which differ to any degree from the medium size. Most of the individuals attain their full size as early as December or January, in order that, when the organs of generation begin to develop themselves in the following spring, they may acquire greater plumpness and strength in all parts of the body—a change which, as we have indicated above, chiefly takes place in the males. Amongst the thousands of specimens which I have examined during the autumn and winter, I have not found a single specimen with the slightest trace of the long teeth that characterize the mature male; and during the summer time all the males, without exception obtain these teeth.

In the young females, at the age of only four months, the ovaries may be seen through the transparent body in the form of two elongated strings, filled with clear eggs; in the spawning-season these

strings take up the greater part of the belly, without, however, as is the case in *Crystallogobius nilssonii*, reaching behind the vent along the root of the caudal fin. The number of the eggs is between 1800 and 2000.

Habits.—This species, as well as the following differs in its habits in several respects from most of the typical *Gobiidæ*. Above the compressed body the laterally placed eyes indicate that they do not live at the bottom, as is the case with the greater number of Gobies, but swim about freely. Neither do they keep themselves dispersed or in single numbers, but in large and dense shoals, where their perfect transparency, in connexion with their inferior size, enables them to avoid immediate observation. Sometimes I have taken them from the stomachs of other fishes; but by far the greatest number are brought up to the surface by the nets set out for different other fishes, especially for the sprat and the young of the common herring. These fishes are caught in the Christiania Fjord in September and so long as the fjord is free from ice—as a rule, until the beginning of the new year. In the spring and summer, when the nets are drawn for mackerel, they are also to be found, and then with the organs of generation fully developed. These nets are drawn at a depth varying from one to fifteen fathoms. An examination of the stomachs of these fishes shows that they contain chiefly pelagic copepods and the fry of mollusks in their swimming-stages; these animals principally live in the upper strata of the sea some few fathoms under the surface. The bottom consists, in most of the inner parts of the Christiania Fjord, of clay and mud, which, in the more shallow water, is covered with *Zostera*.

These fishes seem always to keep together in enormously large shoals; and when the meshes are very fine they are sometimes caught in great masses. The 30th of October 1875 (which was a particularly successful year for their development), I found in a single draught (which, besides, also brought in some young specimens of two or three species of *Gadus*, several *Pleuronectes flesus*, and *Otenolabrus rupestris*, some *Gobii* of common species, and herrings) such large masses of them that I collected between two and three thousand specimens, whilst possibly more than double this number had already escaped through the meshes. In the same year I was not able to notice any diminution of their numbers, and they were always found in the same places; still they are not at all equally numerous every year, and they have been rather scarce both in 1876 and 1877, especially in the latter.

In the Mediterranean they must be produced in still greater numbers, as they are caught in very fine nets and sold as food. In several of the fishing-markets in the towns by the Adriatic and in Sicily Prof. G. O. Sars saw vessels filled to the brim with these fishes alone, forming a complete jelly-like mass. Kessler also mentions their use as food in Odessa.

Upon the least touch the scales fall off; and after the nets are drawn, scarcely a single specimen will have its scales complete, and the greater number will have lost almost every scale. The proportionally

large swimming-bladder, which occupies a considerable part of the belly, expands still further when the individuals are brought up to the surface, the somewhat fatigued fish not being able to compress it so as to make the specific weight of the body to decrease sufficiently to permit it again to descend under the water. The weight of the body is also diminished by the loss of the scales; consequently a great number of such individuals are driven about on the surface of the water in a still living state, till they are carried away by the stream or picked up by sea-birds and other enemies. They swim, however, not without a certain degree of rapidity.

Their enemies are almost all other fishes who occupy the same locality. Especially the different kinds of *Gadus* devour large masses; and even in the case of small specimens of *Gadus morrhua*, *G. esmarkii*, and *G. merlangus*, I have occasionally found the stomach crammed with them. When they float about in their helpless state on the surface of the water, *Gasterosteus aculeatus* and *Spinachia vulgaris* snatch large pieces out of their brittle bodies.

As mentioned above, their food consists chiefly of microscopic copepoda and other small pelagic animals. In the specimens that I have examined in the Christiania Fjord, these principally consisted of the copepods *Dias longiremis*, Lilljeb., *Temora velox*, Baird, together with the larvæ of decapods (*Hippolyte* and *Palæmon*), and mollusks in their swimming-stage (*Cardium*). The stomach contains this kind of food both in the summer and the winter.

Distribution.—Taking for granted, that the forms from Southern, Western, and Northern Europe are identical, *L. pellucidus* has a very wide distribution, although our information touching this species is at present very incomplete. In this case it is met with (possibly in certain spots only) from the western coast of Norway, about 60° N. long., down along Western Europe to the Mediterranean, in the Adriatic, and right up to the innermost parts of the Black Sea.

In Norway it is met with outside of Bergen, and in the Christiania Fjord. At the first-named place the late naturalist Mr. Stuwitz obtained four specimens in December 1834; it has, however, not since been found in this locality. In the Christiania Fjord I have found it in several places inside Doobak, chiefly amongst the islands outside Christiania; most likely it is to be found in the outer parts of the fjord also, and undoubtedly at other places along our southern coast, not mentioned here.

In Sweden it has been found by Dr. Malm in Bohuslen.

In Scotland Mr. Parnell has taken it in Solway Frith, June 1836; and in his 'Catalogue' Dr. Günther states that the British Museum also has specimens from the Frith of Forth.

In the Mediterranean it is known, through Prof. Canestrini, from the Gulf of Genoa; and Prof. G. O. Sars found it in the beginning of 1876 at most of the places visited by him—*e. g.* in Sicily, at Messina, and Syracuse—everywhere in enormous masses. In the Adriatic, whence it was already described in 1824 by Nardo, and afterwards mentioned by several authors, he found it at Trieste.

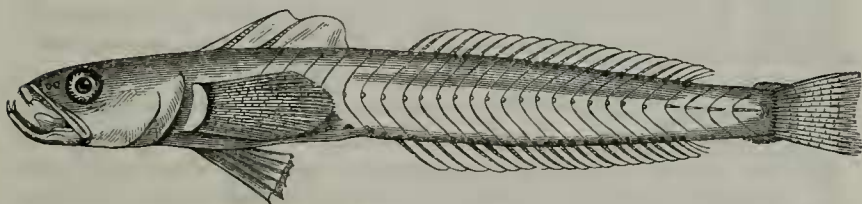
In the Black Sea it was taken in the harbour of Odessa by Kessler in 1859.

Genus *CRYSTALLOGOBIUS*, Gill.

Crystallogobius, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (1863).

Body transparent, elongate, strongly compressed, naked, with parallel muscular impressions. The male only dentiferous, the teeth in a single series; strong canine teeth in the lower jaw. Two separate dorsal fins, the first composed of two spines; ventral fins united, gill openings wide; pseudobranchiæ present.

Fig. 3.



Mature male of *Crystallogobius nilssonii*, in the breeding-season $\frac{1}{2}$.

C. NILSSONI (Düb. & Kor.).

1844. *Gobius nilssonii*, Düb. & Kor. Kgl. Vet. Akad. Handl. 1844, p. 53, tab. 2. fig. 3 (Stockh. 1846).

1861. *Gobiosoma nilssonii*, Günth. Cat. Acanth. Fish. Brit. Mus. vol. iii. p. 86 (Lond. 1861).

1863. *Crystallogobius nilssonii*, Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 269 (Philad. 1864).

1872. *Latrunculus nilssonii*, Coll. Forh. Vid. Selsk. Christ. 1872, p. 10 (Christiania, 1873).

1874. *Latrunculodes nilssonii*, Coll. Forh. Vid. Selsk. Christ. 1874, p. 151 (1875).

The intermaxillary bones in the male very prominent, short; small teeth in front of both jaws, long canine teeth in the lower jaw. The ventral fins united into a funnel, with the shorter rays towards the body. The first dorsal and the ventral fins in the female rudimentary; the ovaries project far behind the vent. Number of muscular impressions 27. The lower jaw the longer.

D¹ 2, D² 19 (20); C. 8 (9 or 10) + 15 (14) + 8 (9 or 10); A. 21; V. 6; P. 30 (31). Lin. lat. 27. Vertebr. 29. M. B. 5.

A. Remarks on the Synonymy.

This species was described by von Düben and Koren in the Vet. Akad. Handl. for 1844, under the name of *Gobius nilssonii*, the description having been taken from half a dozen specimens found off the Bergen coast in 1834-43, although it had earlier, during the same

year, been mentioned, but without any accurate description, and under the temporary name of *Gobius linearis*, by the same author in a letter which was published in *Œfv. Kgl. Vet. Akad. Förh.* May 1844. In Günther's 'Catalogue,' vol. iii. (1861) it is placed under the genus *Gobiosoma*, although the correctness of this is doubted. As early as in 1863 Prof. Gill (*Proc. Acad. Nat. Sci. Philad.*) established for this species a new generic name, *Crystallogobius*. Synonymous herewith is the name *Latrunculodes*, by which, in 1874, not knowing the remarks of Prof. Gill, I entered it in a treatise on the Gobioid Fishes of Norway (*Forh. Vid. Selsk. Christ.* 1874), and later in the same year in a paper on the Fishes of Norway (Supplementary part of the *Forh. Vid. Selsk. Christ.*).

Since the species was entered in the system in 1874, it has not been the subject of detailed description. Nilsson, in his 'Skandinavisk Fauna' (1855), has taken his description from that of Düben and Koren, as is also the case with the few other authors who mention the species.

The same applies to this species as to *Latrunculus pellucidus*, that the characters mentioned in the descriptions only belong to one of the sexes, in *Crystallogobius nilssonii* to the fully developed male. The female of this species, which shows a constant and remarkable difference from the male, has not hitherto been described.

In June 1875 I found the species in the Christiania Fjord in mature state, together with *Latrunculus pellucidus*, though in very much smaller numbers; and more lately I have on a few occasions collected young specimens out of the spawning-season. Although the number of specimens which at present stand at my disposal, namely 33, do not represent an unbroken series of all the different ages of both sexes, I can still give a descriptive account of their principal stages.

B. General Description.

The mature males have a total length of between 43 and 47 millims.; still maturity is evidently attained in some specimens with a length of 38–40 millims. The first dorsal fin has long rays with a wide membrane; the head is thickened, with a short snout; the jaws long, and singularly bent towards each other; the canine teeth in the lower jaw high and curved; and the intermaxillary bones form on each side a strong projection, almost in the form of a nail. A little more pointed is the head, and the body on the whole is more slender, in the males which have not reached a total length of 70 millims.; neither have the jaws nor the teeth in this case attained their full length, though the testicles are filled with ripe milt.

The young males, whose testicles do not yet contain ripe milt, although their total length is only a trifle less than the smallest of the mature specimens, namely 36 millims., have the body thin and slender, the head pointed, almost as in the females; the teeth, however, are already visible, and all the fins normally developed.

The mature females, with the eggs ready for spawning, are considerably smaller, and of a more slender construction, than the

males. Although the total length is almost the same as in many of the mature males (36–37 millims., in a single specimen 39 millims.), their body is so slender and their weight so inconsiderable, that two full-grown females, with the ovaries filled with ripe eggs, were not able to weigh down one large full-grown male. The head is pointed, with short jaws, which are straight and perfectly toothless, and are wanting the males' prominent projection on the intermaxillary bone. The first dorsal and the ventral fins are rudimentary (at a superficial glance they appear to be entirely wanting); the pectoral fins are certainly developed, but very short. The ovaries project far behind the vent on each side of the anal fin.

The young females, with a total length of 30–33 millims., and with the ovaries filled with unripe eggs, have the body very slender and pointed: as in the old female the jaws are toothless, the first dorsal and the ventral fins apparently wanting.

The young during growth.—The few young with a total length of about 25 millims. that have been at my disposal have all been males. This is shown by the first traces of teeth, by the want of the long ovaries, as well as by the presence of all the fins; certainly the first dorsal and the ventrals are short, but never wanting or even rudimentary. These fins may already be seen in the young with a total length of 21 millims., the smallest specimen I have found; in this one, however, there was not yet any trace of the pectorals.

It may therefore be supposed that in the males the first dorsal and the ventral fins spring forth at a very early age, whilst the females never have these fins developed; the pectorals, on the other hand, are present in both sexes (although in the female in a less-developed state), but are always late in appearance.

As compared with *Latr. pellucidus*, the difference in the exterior between the sexes in the present species appears in several ways already at a very early period, whilst this difference in *Latr. pellucidus*, as stated above, only becomes apparent in mature specimens.

The construction of the body is thin and elongated, very compressed, and does not, as is the case in *Latr. pellucidus*, practically increase in plumpness in the spawning-season.

In a full-grown specimen, ready for spawning, with a total length of 46 millims. (caudal included), the length of the head is about 10 millims. and is contained $4\frac{1}{2}$ times in the total length. The greatest height ($5\frac{1}{2}$ millims.) continues almost unaltered from the occiput to about a head's length from the caudal fin, and is contained $8\frac{1}{2}$ times in the total. The vent, on the posterior margin of which there is a small papilla, is situated halfway between the snout and the root of the caudal, and in some individuals projects in the form of a short tube.

In the female, which, as stated above, is considerably smaller than the male, the head is somewhat more pointed. In a specimen with the eggs ripe the head is contained about 5 times or a little more in the total length.

The diameter of the eye is one fourth of the length of the head.

The eyes are situated perfectly laterally, so that the lower margins do not seem to project more than the upper. The interorbital space is, in the female and young specimens, not broader than the diameter of the eye, in the full-grown male a little larger. The branchiostegals are 7 in number; the gill-openings are wide.

The mouth is oblique, with the lower jaw the longer. In the female and the young males the lower jaw is almost straight, or only faintly bent, and the intermaxillary bones are quite even in their outer margin; but in the full-grown male the jaws receive a special development during the spawning-season. The intermaxillary bones then become broad, and form on each side of their margin a distinct projection, almost in the form of a nail; at the same time that the teeth reach their full development the lower jaw becomes long and strongly curved upwards, and when the mouth is shut it reaches a little in front of the intermaxillary bones, the projecting nail of which encloses the almost angularly curved upper part of the lower jaw. The point of the latter jaw is square, and, as is the case with the intermaxillary bones, in the male dentiferous. In these old males the gape reaches backwards to the posterior margin of the eye, whilst in the female and the young males it scarcely reaches beyond the middle of the eye. The length of the lower jaw in proportion to the total length is in the old males as $1:7\frac{2}{3}$, in the female as $1:10\frac{1}{4}$.

The number of *vertebræ* is 29.

The teeth.—Whilst during its immature state *Latr. pellucidus* has a construction of the teeth common to both sexes, which continues permanent in the female, whilst the male towards the spawning-season in a comparatively short time changes these teeth for another set of a totally different construction, this is not the case with *Crystallogobius nilssonii*. First, the female is perfectly toothless all her life; secondly, the teeth of the male, which are composed of both small and acute teeth and long canine teeth, are developed very early, and all reach their full size during the spawning-season.

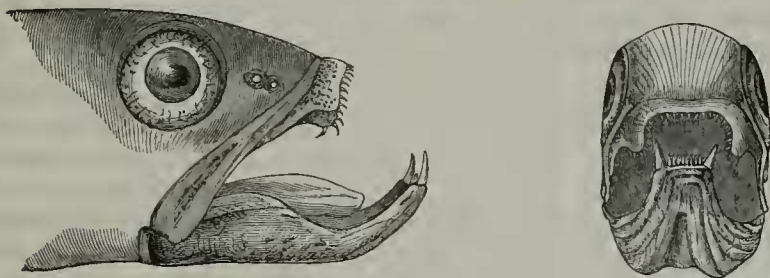
The exact time when the teeth make their appearance in the young is probably when they are about two months old. A young one, with a total length of 21 millims., and perhaps about one month and a half old, had no traces of teeth.

In the young males, which have reached a total length of 26–28 millims., the teeth begin to show themselves in the intermaxillary bones and the point of the lower jaw; at this period all the teeth are about equal in size.

In the male during the spawning-season, when the teeth have reached their full size, the projecting intermaxillary bones have on their upper and prominent portion a single row of closely placed, small, acute, and curved teeth, 13–14 in number, on each side (see fig. 4); on the lower square margin one or two teeth directed straight downwards or backwards are found. The maxillary bones are without teeth, as well as the vomer. In old males the outer part of the lower jaw runs out in a long upward curve, which at

its point is dentigerous, while otherwise the jaw has no teeth; the innermost part of this jaw forms a sharp edge, which, as the jaws meet one another, places itself inside the corresponding part of the upper jaw, whilst the point of the lower jaw, as mentioned above, is encompassed by the outward-bent intermaxillary bones. The point of the lower jaw is square and broad, and has a remarkable similarity to the jaw of a carnivorous animal. On each side of the square point is found a long and curved canine tooth, and between them a row of, together, eight small and acute teeth of the same construction as those in the intermaxillary bones.

Fig. 4.



Snout of mature male of *Crystallogobius nillsoni* in the breeding-season, strongly magnified.

The female must be pronounced toothless, as such teeth as can be found are partly irregular and partly perfectly microscopical. In a fresh or soft specimen it is scarcely possible to find even a trace of teeth; but in a dried specimen a couple of very minute and straight isolated teeth may be seen, with the aid of the microscope, on the middle of the lower jaw; these, however, are sometimes entirely wanting on one side. In a full-grown female the length of these teeth is about $\frac{1}{20}$ to $\frac{1}{15}$ of a millim.

The fins.—The first dorsal fin, which has two rays, becomes only fully developed in the mature or the nearly full-grown male, but is much shorter in the young (not half-grown) male, and rudimentary in the female. In the males it has strong but not stiff rays, which are placed at comparatively large intervals, and considerably sloped backwards, and have the point almost bent downwards, the membrane, which begins already a little in front of the first, continuing behind the last, and running along the dorsal line towards the beginning of the second dorsal fin; in some specimens it even connects both fins completely. The first ray is a little shorter than the second, the length of which does not much exceed the greatest height of the body. In the young males the rays are shorter, and the membrane between them incomplete. In the female they are shortened to such an extent that they can only be discovered by very minute examination; sometimes only one ray seems to be developed. In the female the length of the rays seems never to exceed the length of the eye, and is generally shorter, sometimes having only the length of the crystalline lens.

The second dorsal has nineteen, sometimes twenty rays, the last of which is a double ray. By means of a strong membrane the rays are directed strongly backwards, and appear, therefore, lower than they really are; they are all even, and have a length equal to half the height of the body. The posterior rays are not elongated even in the male, and reach to an orbital diameter's distance from the root of the caudal fin. All the rays are indistinctly articulated, and undivided; and it is only by the aid of the microscope that in some individuals a trace may be seen of an indistinct division at the point. Still shorter and more delicate are the rays of the female, their length being scarcely equal to an orbital diameter.

The caudal fin has fifteen articulated middle rays, sometimes only fourteen; also on each side eight, sometimes nine or ten short connecting rays, which are widely divergent in their points, especially the foremost, so that they can even point forwards, giving the root of the fin an increased breadth. The middle rays are articulated, and all of them divided from about the middle (except the two outermost on each side); but neither of the branches is further divided. The first ray is short and thin, and the articulation is not very plain; the fourth and fifth rays are the longest, while the middle rays again become shorter. One consequence of this is, that the fin becomes more or less emarginate, with rounded edges; it is rather short, and scarcely attains the greatest height of the body.

The anal fin counts twenty-one rays, the hinder of which is a double ray. It takes up nearly the whole space between the vent and the caudal, and agrees very much in its form and construction with the second dorsal. It is only by very favourable light that any trace of articulation in the points of the rays can be discovered, and not in all of them. The last ray reaches almost to the root of the caudal; in some undamaged individuals it is even connected with the last-named fin by a membrane, whilst this membrane is wanting in others.

The pectoral fin counts thirty, sometimes thirty-one rays. Twelve to fourteen of the middle rays are singly divided from about the middle; the remainder are undivided. All are finely articulated. The form of the fin is broadly rounded. The pectoral fins are not very long; in mature males they have about two thirds of the head's length, and do not reach to the vent. In young males and in the female they are much shorter, although they are never rudimentary.

The ventral fins, which are attached close to the root of the pectoral fins, and just behind the lower end of the gill-openings, are well developed in the mature male, shorter in the younger male, and rudimentary in the female.

When present they form a closed and deep funnel, which is square-cut behind, and, contrary to what is found in the other *Gobiidæ*, have their innermost rays (nearest to the belly) shorter than the outer ones. The number of the rays is six in each fin: of these the first is divided from about the middle; the remainder are more slender, undivided, and not articulated. On the whole, the faint

tendency to division of the rays is characteristic of this species as compared with *Latrunculus pellucidus*, in which division of the rays takes place especially in the ventral fins. The funnel is comparatively short; when closed it is, even in the male, removed from the vent to a distance about equal to its own length. In young males the ventral fins are very small, and their funnel-like shape is almost imperceptible, the connecting membrane being incomplete.

In the female the ventral fins are completely rudimentary, being only present as a couple of two disconnected and very short rays scarcely the diameter of the eye in length.

The *mucous glands*, which in *L. pellucidus* form so extensive a system, seem to be almost entirely wanting in *Crystallogobius nilssonii*; in none of the specimens which I have examined have I been able, with certainty, to find a single complete row of such glands, either on the head or on any other part of the body.

The skin.—No trace of scales has hitherto been detected in any of the specimens examined. As is the case in *L. pellucidus*, the whole side of the body shows a row of transverse impressions; when examined in the microscope, no trace is found of follicles to which lost scales may have been attached; and it is therefore scarcely to be doubted that the body is altogether naked in this species. The number of these muscular impressions is twenty-seven, twenty of which have their place behind the vent; they bend together into the form of an angle in the middle line of the body, and denote exactly the number and size of the vertebræ. An actual lateral line, with open pores, does not exist.

The colour.—As is the case in *L. pellucidus*, the body during life is transparent, with a faint bluish tinge, thereby enabling the vertebræ, the apple of the eye, &c. easily to be seen. The coloration of the skin is very faint, and does not vary in this respect to any degree, even during the spawning-season. The eyes are strongly coloured, their upper edge being of a shining metallic lustre (black after death); the iris is silvery. A well-defined blackish spot is found at the point of the lower jaw; another black stripe stretches along the throat towards the ventral fins. At the root of each ray in the anal and the caudal fin there is a black point; these together form a continuous and distinct row, which is present in both sexes and at all ages; along the dorsal fin there is found a somewhat fainter row of brownish points, which is indistinct, or nearly wanting, in the female. Moreover all the rays are covered with minute blackish points. The body itself is almost unspotted (whitish when preserved in spirits), except on the sides of the belly, where a row of fine brownish spots stretches itself; these spots are largest and most distinct in the breeding female, their number being 3-5 on each side.

C. *Habits and Distribution.*

Generation.—With regard to the time of breeding and its duration, nothing conclusive can be said at present on account of the very

few materials at my disposal. In all probability *Cryst. nilssonii* reaches (as is the case with *Latr. pellucidus*) maturity at the age of one year, after which it disappears. The spawning-season is probably the same as in the other species, consequently during the summer months; on the whole, however, it appears to have a somewhat longer duration.

From the researches I have been able to make among collected specimens, compared with those preserved in the Museum of the University, it appears that the spawning probably begins in some individuals as early as in March or April; perhaps the greater number attain their maturity in the last part of June; whilst in other specimens the spawning does not take place before the beginning of August, or perhaps later. After the conclusion of the spawning the specimens no doubt perish, their life having thus lasted only one year.

Habits.—In its habits this fish probably agrees perfectly with *Latr. pellucidus*. The extraordinarily compressed body denotes that it swims freely about in rather deep water, and not, like most of the true *Gobii*, resting itself at the bottom; in fact this would be almost impossible, on account of the peculiar construction of the ventrals of the male, and, in the case of the female, from its entire want of these fins. Most of the specimens mentioned by other authors have been taken in the dredge at a depth of 30 fathoms. Von Düben and Koren state that some of their specimens crept into empty tubes of *Chaetopterus norvegicus*, in which, however, they had only taken refuge whilst the dredging was going on.

In the Christiania Fjord I have taken these fishes, together with *Latr. pellucidus* in nets set out for mackerel, *Clupea sprattus*, and young of *Cl. harengus*. The nets bring them to the surface in the same manner as is the case with *L. pellucidus*. As a rule they lose the capability of again descending, from the swimming-bladder becoming strongly distended when they reach the upper strata of the water. This fish is met with in far less numbers than the last-named species. In the same manner it is taken as food by other fishes; and I have taken it from the stomach of small young examples of *Gadus morrhua*.

Food.—Upon examining a number of stomachs of individuals taken in the month of June, I have found them filled with digested remains of Entomostraca, without, however, being able to recognize any species of them. Probably they were Calanidæ, or, perhaps, pelagic Copepoda of the same species as are found in *Latr. pellucidus*.

Distribution.—Besides being found in Norway, *Cr. nilssonii* has been taken more lately on the coast of Bohuslen (Sweden); and perhaps it also occurs on other parts of the coast of Northern Europe. In Norway its habitat extends from the Christiania Fjord along the western coast, nearly to the Trondhjems Fjord, in about 63° N. latitude.

The most northern point at which it has been found was at Christiansund, in July 1843, by v. Düben, and also about the same

time at Askwold, in Sond-fjord, by Mr. Christie—in all only six specimens.

In the neighbourhood of Bergen five specimens were taken by Mr. Stuwitz, December 1834; in 1850 one specimen was found at Bongestrømmen, near the town: in all six specimens.

One specimen was dredged by Prof. G. O. Sars at Espevar, in the mouth of the Hardanger Fjord in August 1873.

In the mouth of the Christiania Fjord two specimens were dredged in two different localities about 1860; finally, in the years 1875-77 I took twenty-eight specimens in nets between the islands off Christiania.

In Sweden two specimens were found (in a dead state) in Bohuslen by Dr. Malm, in June 1877.

March 19, 1878.

Arthur Grote, Esq., V.P., in the Chair.

Mr. Selater exhibited the type specimen of *Dicrurus marginatus* of Blyth (Ibis, 1865, p. 46), belonging to the Derby Museum, Liverpool, and pointed out its identity with *Muscipipra vetula* (Licht.) of Southern Brazil, of the family Tyrannidæ.

The following papers were read:—

1. Contributions to the Ornithology of the Philippines.—No. VI. On the Collection made by Mr. A. H. Everett in the Island of Leyte. By ARTHUR, Marquis of TWEED-DALE, F.R.S., President of the Society.

[Received February 25, 1878.]

The island of Leyte is about 130 miles long, and has an average breadth of 35 miles. It lies S.S.W. of Samar, its northern part lying in close contiguity to Samar. Zebu is situated to the west, and Dinagat to the south-east, while Mindanao is due south. Water-channels of unimportant breadth separate Leyte from these other islands. A peculiar ornis is therefore not to be expected, and Mr. Everett's researches have not made known any special feature. That gentleman, however, procured all the birds of which I propose to give a list at Amparo (on the south-west coast of Leyte) and in its vicinity. But Mr. Everett writes that he does not believe the collection he sends at all adequately represents the avifauna of Leyte, and he hopes to revisit it and explore the mountains in the centre and south of the island.

The most interesting species is *Buceros semigaleatus*, a purely local form, distinguishable from the two previously known Philippine